



Laboratories in the Man-Systems Division's Crew Interface Analysis Section were on display recently. Story on Page 3.



Betty Burg, left, and Jennifer Reynolds are this year's JSC "Small Business Buyers of the Year." Story on Page 4.

# Space News Roundup

Vol. 30

May 3, 1991

No. 18

## Space Center Houston groundbreaking set

Construction countdown clock ticking now that funding secured

The countdown clock is at L-minus-25 days and counting today for Space Center Houston, now fully funded after the sale of bonds that will finance the project.

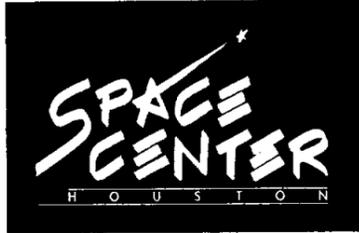
Groundbreaking ceremonies for the new \$70 million visitor center at JSC are set for 11 a.m. May 28. All JSC and contractor employees and the public are invited.

Officials of the non-profit Manned Space Flight Education Foundation Inc., developers of the facility, Tuesday received the proceeds from a \$68 million-plus tax-exempt bond sale. Co-underwriters of the bond offering were Lehman Brothers and Apex Securities.

Harold Stall, MSFEFI president and JSC public affairs director, said construction will begin on its 123-acre site near JSC's main gate immediately after the groundbreaking.

"We have been working toward this day for six long years and we are proud that Space Center Houston will soon be a reality," Stall said.

The ceremonies are expected to follow a space flight countdown and launch theme,



event planners said. Light refreshments will be served, and each guest will receive a commemorative gift. More details about the ceremonies will be announced as plans mature.

The guest list is long, and includes top NASA managers, federal, state and county officials, and area mayors.

"We expect large and enthusiastic crowds to join us in celebrating this historic milestone," said Vance Ablott, general manager

of Space Center Houston.

Grand opening is set in the fall of 1992. The 183,000-square-foot facility will occupy 50 acres of land to the left of the main entrance.

Walt Disney Imagineering designed the "experience center" using the services of Bob Rogers and Co. and Waisman, Dewar, Grout & Carter Architects and Planners. Rogers and Co. has a continuing contract with Space Center Houston for shows, while a joint venture of CRSS/Linbeck will be responsible for construction management with Pierce, Goodwin, Alexander & Linville

Please see VISITOR, Page 4

### Little damage

## Fire injures two ground mechanics

By Barbara Schwartz

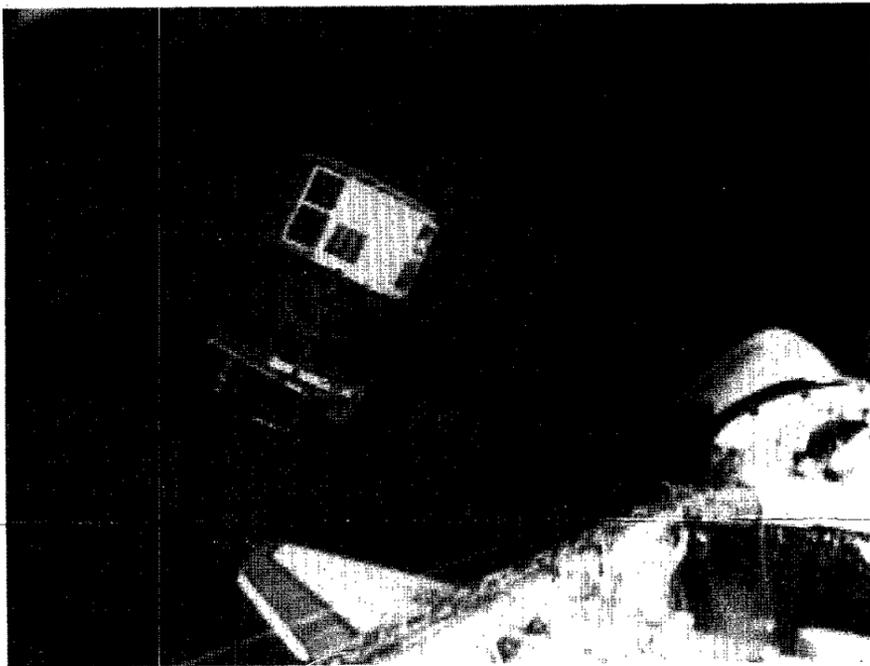
Two ground mechanics were injured Tuesday at Ellington Field while they were checking out a newly installed engine on NASA 2, a Gulfstream I aircraft.

The mechanics, Jeffrey Lightfoot and Joseph Bezner, were bleeding fuel from the engine when a spark ignited the fuel.

The two Northrop Worldwide Aircraft Services Inc. employees were taken to Humana Hospital-Clear Lake.

Lightfoot was admitted to the hospital with a fractured heel suffered when he jumped from a ladder. Bezner was treated for burns on his hand and released.

The 9:30 a.m. fire was quickly extinguished by on-site personnel with insignificant damage to the aircraft.



The first of three Chemical Release Observation canisters leaves *Discovery's* payload bay at 8:30 p.m. Wednesday. Cameras on the Infrared Background Signature Survey Satellite, deployed Wednesday, will train on clouds of rocket fuel that will be released from the canisters.

## Discovery's ballet gets rave reviews

By Kelly Humphries

The curtain went up a bit late, but when *Discovery* and its crew finished their orbital ballet Thursday the rave reviews began pouring in.

"You have congratulations from everybody down here for a really super job," CapCom Kathy Thornton said Wednesday after the first set of Strategic Defense Initiative rocket plume observations.

"I'm really proud of the crew and I'm proud of the crew on the ground," said Commander Mike Coats. "That was a nice job. Tell John Malarkey his milkshake tasted very sweet."

Coats' comment referred to the rapid-fire course and attitude adjustments that made up the "Malarkey Milkshake" named after Orbit 2 Rendezvous Officer John Malarkey.

Bright flashes of light exploded across television screens with each orbital maneuvering system or reaction control jet firing when the crew sent ground controllers taped video of plume observations recorded by the Shuttle Pallet Satellite II eight miles away. A prime payload is the Infrared Background Signature Survey which consists of three elements, including the SPAS-II. SPAS-II cameras observe orbiter jet firings while the satellite is in the payload bay, in free flight or attached to *Discovery's* remote manipulator system. The IBSS is a Strategic Defense Initiative Organization program designed to obtain scientific data that could be used in developing ballistic missile defense sensor systems.

"It came together today and I think we're on a roll," IBSS Program Manager Mike Harrison said Wednesday after the far-field maneuvers.

The fleet's most-flown shuttle gave the crew and Mission Control team only minimal problems. Payload

Please see MALARKEY, Page 4



## Endeavour stop iffy; Columbia rolls out to pad

NASA's newest space shuttle, *Endeavour*, may fly from Edwards Air Force Base in California to Houston's Ellington Field today if weather conditions permit.

*Endeavour* was expected to make the trip to Houston Thursday on its way to Kennedy Space Center, but its flight was postponed because of turbulent weather between Edwards and any potential midway points. Officials were scheduled to meet in a weather briefing this morning prior to *Endeavour's* takeoff to decide whether it should depart and the potential routing of the flight.

If the flight to Houston is possible,

*Endeavour* will arrive at Ellington about noon. A welcoming ceremony is planned immediately after it arrives if the orbiter stops at Ellington. Employees should call the Employee Information Service Code-A-Phone at x36765 for updates.

The Space Shuttle *Columbia* rolled out to KSC's Launch Pad 39B about midnight Wednesday in preparation for its STS-40 flight.

The STS-40 Shuttle Interface Test verified the critical connections between *Columbia's* stack and the launch platform. Workers will conduct the helium signature leak test and main engine flight readiness

test this weekend.

The STS-40 terminal countdown demonstration test will take place Monday and Tuesday, and the flight readiness review for the Spacelab Life Sciences mission will be May 13 and 14.

In Orbiter Processing Facility Bay 2, technicians have removed *Atlantis's* three main engines and drained residual hypergolic propellants. The left aft center booster segment for the STS-43 mission is being stacked in the Vehicle Assembly Building in preparation for a July mission that will deploy another Tracking and Data Relay Satellite.

### Scientists elated with results

## Hubble celebrates first anniversary

NASA's Hubble Space Telescope completed its first year of operation last week, and scientists are elated with the results.

The observatory was launched from Kennedy Space Center on April 24, 1990, and deployed from the Space Shuttle *Discovery* the next day. Shortly after deployment scientists and engineers determined that the telescope's eight-foot mirror suffered from a "spherical aberration" that dulls the focus of observations of the spacecraft's five scientific instruments.

Although scientists at first believed the effectiveness of the observatory would be impaired seriously, significant observations have been made during this first year and observing efficiency has increased steadily, said Joseph H. Rothenberg, associate director of flight projects for

HST at Goddard Space Flight Center.

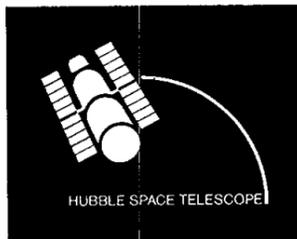
While scientists are disappointed by the limitations brought about by the aberration, their expectations with the observatory generally have left them pleased with the results and excited about the science they have been able to achieve, he explained.

Even with the spherical aberration, a European-built solar array that has caused stability problems and a failed attitude control system gyro, Rothenberg pointed out, Hubble has:

- Completed orbital verification, a period designed to check out the sub-systems of the spacecraft;

- Completed a significant portion of science verification, checking out and calibrating the spacecraft's

Please see HUBBLE, Page 4



The Hubble Space Telescope celebrated its first year in space last week. This is a composite image of the planet Mars, 53 million miles from Earth, taken by HST's Wide Field and Planetary Camera.

NASA Photo

JSC

# Ticket Window

The following discount tickets are available for purchase in the Bldg. 11 Exchange Gift Store from 10 a.m.-2 p.m. weekdays.

General Cinema (valid for one year): \$4.  
 AMC Theater (valid until May 1992): \$3.75.  
 Loews Theater (valid for one year): \$4.  
 Astroworld (valid 1991 season): season, \$44.94; child less than 4 feet, \$10.12; one day, \$15.85; Waterworld, \$8.13.  
 Seaworld of Texas (valid 1991 season): child (3-11), \$12.25; adult, \$17.25.  
 Galveston Historical Homes Tour (May 4, 5, 11 or 12): \$11.

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# Gilruth Center News

**Sign up policy**—All classes and athletic activities are first come, first served. Sign up in person at the Gilruth Center and show a badge or EAA membership card. Classes tend to fill up four weeks in advance. For more information, call x30304.

**EAA badges**—Dependents and spouses may apply for a photo I.D. 6:30-9 p.m. Monday-Friday. Cost is \$5.

**Defensive driving**—Course is offered from 8 a.m.-5 p.m., July 13 and Aug. 10. Cost is \$15.

**Aerobic dance**—Eight-week session meets 5:15-6:15 p.m. Tuesday and Thursday nights. Cost is \$24.

**Exercise class**—Class meets 5:15-6:15 p.m. Monday and Wednesday nights. Cost is \$24.

**Weight safety**—Required course for employees wishing to use the Gilruth weight room. The next classes will be from 8-9:30 p.m. May 8 and May 22. Cost is \$4.

**Aikido**—Martial arts class meets for six weeks from 6:30-7:30 p.m. beginning May 14. Cost is \$30.

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# Technical Library News

These new publications are available in the JSC Technical Library, Bldg. 45, Rm. 100.

*Learning to Program in C.* Thomas Plum, 1983. QA76.73.C15 P58 1983.

*On the Glassy Sea: An Astronomer's Journey.* Tom Gehrels, 1988. QB36.G44 A3 1988.

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# Swap Shop

## Property

Sale: Egret Bay condo, 2-2, cov parking, all appli, FPL, blinds, fan, patio, storage, pools, boat ramp, \$42.9K. x30092 or 481-3637.

Sale: Friendswood custom 3-2-2D, landscaped, deck, trees, atrium, FPL, whirlpool in master, \$87K. 482-2138.  
 Sale: Friendswood, Wedgewood Village, 3-2-2, over 2000 sq ft, lg rec rm, new roof, \$62.9K. Jeff, 333-7010 or 482-5393.

Rent: One BR house, w/20' x 40' shop and utility rm., \$350 plus dep, 554-2267.  
 Lease: South Houston, 2 BR, lg yard, brick, \$550/mo. 947-0697.

Rent: Lake Livingston, waterfront, 3-2, CA/H, furn, cov decks, pier, ex cond, wknd/wk, 482-1582.

Rent: Baywind One condo, 1-1-1, ceiling fans, dishwasher, range and refig w/coemaker, \$320/mo plus dep. Bill, x39376 or 332-9728.

Rent: Freeway Manor, 3-1-1.5, gas range, refig, W/D conn, \$450/mo plus dep. Bill, x39376 or 332-9728.

Rent: Univ Trace condo, 1BR, study, W/D, microwave, ceiling fans, DW, \$495 plus \$350 dep, avail 5/1/91. 488-1454 or 282-4616.

Sale: LC Dove Meadows, 3-2-2, 1800 sq ft, brick, lg screened porch, FPL, custom, \$72K. x39182 or 534-2179.

Sale: El Dorado Way condo, 1-1.5, FPL, all elec, all appli, cov, parking, balcony, \$35K. Jim, 280-8503.

Sale: CL 2-story condo, 1-1.5-1CP, patio, balcony, all appli, alarm, ceiling fan, FPL, assume, \$38K. 486-0508.

Sale: 25 ac near Alvin, 900' road frontage, barn, well, \$3600/ac. 585-8035.

Sale: Pearland, Dixie Hollow subdiv lot for med density homes, concrete street, all util, x395303.

Sale: Central Texas building 2 story, approx 10K sq ft, reasonably priced. 482-5003.

Rent: Nassau Bay townhouse, 4-2-2, over 2000 sq ft, master dwn, huge garage, 2-story den, FPL, deck, atrium, \$1095/mo. Jerry, x38922 or 488-5307.

Lease: Webster/Ellington, 2-1 apt, W/D, \$460/mo. Dave, x38156 or Herb, x38161.

Rent: Friendswood, enclosed RV storage stall, 40' deep, lights/pwr, reasonable. 482-9396.

Sale: El Dorado Trace condo, 1-1.5-CP, all appli, patio, balcony, FPL, fans, assume. Joyce, 286-1177.

Rent: Lake Travis cabin, private boat dock, CA/H, fully equip, accom 8, spring/summer, \$325/\$425 wkly, \$80/\$85 dly. 326-5652.

Rent: Galveston condo, 2-1, one block from Gulf, decorator accents, all appli, FPL, cov parking, \$495/mo. 289-6777.

Lease: Nassau Bay, 4-2-2, 2000 sq ft, 2 living areas, newly redecorated, deck, 1.5 story, no pets, \$990/mo. 484-4944 or 333-6806.

Sale: Bay Glen, 3 BR w/study, marble and ceramic floors, decorator window treatments, mid \$120s. 486-3977.

Rent: Galveston condo, Seawall Blvd & 61st St, furn, sleeps six, cable TV, swimming pools, wk/wknd/dly. Magdi Yassa, x38470 or 486-0788.

Rent/FPL: Clear Lake marina condo, three level, all appli, FPL, wet bar, 2-2.5-2, \$850/mo. 474-4922.

Sale: Pearland, Southwyck, 3-2.5-2A, 3 yr old, 1.5 story brick Tudor, 5 ceiling fans, mini-blinds, FPL, assume 9.5% w/approval, low equity, \$92K. 997-2069.

## Cars & Trucks

'85 Lincoln town car, Signature ser, loaded, wire wheels, 76K mi, ex cond, \$8000. x36804 or 482-7156.

'74 BMW 2002, 120K mi, red w/bk int, 4-sp, A/C, records, runs great. x35034 or 488-0676.

'83 Coleman Royale pop-up camper, sleeps 6/queen sz bed, stove/sink, icebox, 1000 lb total wt, garaged, ex cond, x35034 or 488-0676.

'86 Mazda 626, 5 spd, A/C, AM/FM/cass, ex cond, \$3975 OBO. Mary, x30201 or 481-3859.

'86 Ford Escort, pwr steering/brakes, std trns, A/C, \$2200. Rhonda, 283-0408 or 474-5120.

'78 Chev custom van, 350 V8, ex cond, new tires, new A/C compressor, cruise, \$3000. 280-1281 or 947-0697.

'88 Ford Mustang LX hcbk, V8, auto OD, all pwr, A/C, cruise, custom wheels, handling pkg, alarm, 14K mi, \$8475. 482-1535.

'76 Datsun 280Z, good cond, \$2000 OBO. 280-1939.

'89 Ford F150 XLT Supercab, auto, A/C, camper top, towing pkg, 6 cyl, ext warr, \$11,750. 585-8035.

'87 Toyota Mirai-2, 33K mi, white, sunroof, ex cond, \$11.5K. Mike, 283-5579 or 332-1617.

'88 Suzuki Samurai, white w/bk removable hard top, new soft top. 43K mi, \$5200. Tim, x38843 or 332-6153.

'84 Ford F150 extended cab PU, long bed, 8 cyl, cruise, A/C, good cond, x30853 or 488-2585.

'83 Monte Carlo, \$2500 OBO; '84 Mustang, \$2500 OBO. Gretchen, 283-0446 or 482-6744.

'82 Ford Anaheim custom van, P/S, P/B, AM/FM stereo, 4 capt chair, sofa/bed, 2 A/C, 2 tanks, CB, cruise, tilt, BO. 488-3191.

'86 Buick Century Ltd, ex cond, pwr locks, cruise, A/C, AM/FM/cass, tint, new tires/shocks/carb, 65K mi, \$4750 OBO. x32746 or 488-7856.

'80 Honda Accord, 2 dr, grey, good cond, \$1200. x31883.

'87 Jeep Cherokee Laredo, 4WD, 2 dr, red w/beige int, ex cond, \$8700. Dennis, x30417 or 332-6257.

'82 AMC Eagle sedan wagon, 4WD, loaded, leather, 76K mi, good cond, \$2500. x34213 or 286-7149.

'80 Pontiac Phoenix, V6, 5 dr lftbk, auto, stereo AM/FM, good cond, \$1950. x30092 or 481-3637.

'57 Porsche Speedster kit car, hi perf eng and trans, \$10,500. David, 332-9044 or 929-7012.

'79 Ford Fairmont, rusty, runs great, \$500 OBO. 471-2885.

'87 Ford Tempo GL, blk w/red int, 4 dr sedan, 75K mi, ex cond, 538-1051.

'79 Dodge Omni, manual trans, new brakes/clutch/batt, AM/FM/cass, new inspec and license, \$800. 282-4898 or 481-9523.

'84 Honda CRX, ex cond, \$2900. 286-0136.

'88 Mitsubishi Precis, 5 spd, A/C, AM/FM/cass, new tires, \$3500. 333-7070 or 482-2342.

'89 Ford Probe GT Turbo, ex cond, \$10,895. Dan, 280-2780 or 457-2850.

'84 Buick Park Ave, \$4995. 996-9157.

'90 Tercel, 2 dr sedan, teal, auto, loaded, tint, ex cond. x30946.

## Cycles

10h 10 spd men's bicycle, ex cond, stored indoors, \$150. Mike, 333-2335.

'86 Yamaha 700 Maxim, shaft drive, inline 4 cyl, ex cond, 4K mi, cruiser style. \$2400 OBO. Jim, x37258 or 538-1865.

Compania 24" men's 10 spd bike w/Suntour derailleurs, Dra-Coupe center-pull brakes, \$50; Murray 19" ladies' 10 spd bike w/Falcon access and gear/wlight, \$25. Stacey, x32649 or 480-9793.

'81 Honda 750 custom Windjammer, radio, low mi, good cond, \$500 OBO. Bruce, 488-0396.

'84 Kawasaki GPZ 750 motorcycle, 8.5K mi, clean, \$2000. Shannon, x32646 or 484-5412.

## Boats & Planes

'88 19' Sea Ray I/O V6 175 Bow Rider, 70 hr on eng, all extras incl, \$9500. 485-0396.

Evinrude 25 hp, elec start, new, \$1400. Jerry Craig, 283-5311 or 420-2936.

Coleman 17' canoe w/paddles, ex cond, \$300 OBO. 282-4839 or 554-7601.

Quachita 17 aluminum canoe, \$400. 474-4663.

'83 Henken 18 sailboat, roller furling bilg, 4 hp aux, galv trlr, sleeps 4, good cond, \$4000. 339-3476.

## Audiovisual & Computers

"Advanced Programmer's Guide to EGA/VGA" Vol 1 (book and disk) by George Sully and Steve Black, new, was \$44, now \$25. 335-2991.

Commodore 64/128 computer, fully equipped, regular and muppet keyboard, color monitor, games and WP SW, \$600. 286-8417.

PC AT 286 computer, 1MB RAM, 1.2 MB FD, Emerson paper-white monitor, \$555; 42 MB HD and color VGA avail. 282-3261.

Apple IIc computer, color monitor, printer and stand, computer desk, disk drive, SW and books, games, \$575. Vicki, 482-5947.

Two Audio Techniques home speakers, 125 W per channel, wood casing, one mo old, warr, \$250. 334-2507.

Macintosh SE/30, 2 MB RAM, 40 MB HD, std keyboard, some SW, manuals, ex cond, \$2500 OBO. 286-2213.

Battery backup for computers, used w/AT&T computer, El Gar mod SPF880, rating 550VA, ex cond, was \$600, now \$300. Jimmie, 333-2009.

Commodore 128D w/built in 1571 disk drive, Commodore 1526 printer, Roland DG color monitor, modem, manuals, SW, \$500, warr exp 9/91. John x38429 or 482-6536.

80386 sys w/80 MB, 19 ms HD, Sony 1304 monitor w/1024 x 768 card, 4 MB RAM, 3.5 and 5.25 high density drives, \$2200. x30355 or 996-1410.

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# Dates & Data

## Today

**Alumni League meets**—The NASA Alumni League's JSC chapter will meet from 1-5 p.m. May 3 in Bldg. 1, Rm. 966. Call Jack Heberlig at 333-0928 for details.

**AACE workshop**—The American Association of Cost Engineers Houston Gulf Coast Section will present its annual spring workshop May 3-4 at the Hobby Airport Hilton. Max Engert, deputy director of Engineering, will be the keynote speaker. Cost of the 16-session workshop is \$150 for any NASA and support contractors. For more information, call Ralph O'Neal at 492-3922 or 492-4000.

**Cafeteria menu**—Special: Salisbury steak. Entrees: baked scrod, 1/4 broiled chicken with peach half. Soup: seafood gumbo. Vegetables: cauliflower au gratin, mixed vegetables, buttered cabbage, whipped potatoes.

## Saturday

**JSC Picnic**—The 1991 JSC Picnic will be from 11 a.m.-5 p.m. May 4 at the Gilruth Center. For more information, call Melody Goss, picnic committee chair, x33152.

**Alumni League meets**—The NASA Alumni League's JSC chapter will meet May 4 in conjunction with the JSC Picnic in the Gilruth Center (Alumni Rm. 2nd floor). Call Jack Heberlig at 333-0928 for details.

## Monday

**Cafeteria menu**—Special: beef and macaroni. Entrees: ham steak, Parmesan steak. Soup: chicken and rice. Vegetables: green beans, car-

rots, au gratin potatoes.

## Tuesday

**Electronic packaging forum**—NASA Headquarters will sponsor a presentation on "Development of Electronic Packaging Technology" from 8:30 a.m.-4 p.m. May 7-8 at the Gilruth Center, Rm. 206. Unisys employees will conduct the presentation. For more information contact Clyde Evans, x36455, or Arnell Jalbuena, Loral, 335-2446.

**Cafeteria menu**—Special: Mexican dinner. Entrees: potato baked chicken, barbecue spare ribs. Soup: tomato. Vegetables: squash, ranch beans, Spanish rice, broccoli.

## Wednesday

**Cafeteria menu**—Special: baked meatloaf with Creole sauce. Entrees: baked scrod, liver and onions, ham steak. Soup: seafood gumbo. Vegetables: beets, Brussels sprouts, green beans, whipped potatoes.

## Thursday

**NPMA meets**—The JSC National Property Management Association's annual picnic will be at 5 p.m. May 9 at the Gilruth pavilion. Bring a covered dish. Cost is \$3 per person. For more information contact Sandra Pierce, 282-4151.

**Cafeteria menu**—Special: smothered steak with dressing. Entrees: chicken and dumplings, corned beef with cabbage. Soup: beef and barley. Vegetables: spinach, cabbage, cauliflower au gratin, parsley potatoes.

## May 10

**Asian Pacific day**—JSC will celebrate Asian Pacific American Heritage Day from 8 a.m.-4:30 p.m. May 10 at the Gilruth Center. Air Force Maj. Gen. Vernon Chong will be the keynote speaker at the 11:30 a.m. luncheon. For luncheon tickets, contact an Asian Pacific American Council member by May 6. For more information, contact Hanh Nguyen-Xuan at x36805.

**Cafeteria menu**—Special: tuna and salmon croquette. Entrees: pork chop with yam rosette, Creole baked cod. Soup: seafood gumbo. Vegetables: Brussels sprouts, green beans, buttered corn, whipped potatoes.

## May 13

**NCMA class**—The National Contract Management Association and University of Houston-Clear Lake will sponsor a course in contract law from 8 a.m.-4 p.m. May 13 and 14 at UHCL, Rm. 2-532. Cost is \$100 per person. Ron Perlman, manager of the Federal Contracts Section for the Porter, Wright, Morris and Arthur law firm in Washington, D.C., will teach. For additional details, contact Jean Stell, UHCL, at 283-3122 or 283-3120.

## May 20

**FWP luncheon**—The Federal Women's Program will present Mayor Kathy Whitmire at a luncheon at 11:30 a.m. May 20 at the Gilruth Center. For \$7.25 luncheon tickets, contact an FWP working group member. For more information, call Freda Marks at x30603.

Pair of Advent Prodigy tower speakers, \$250; pair of Advent Baby II speakers, \$150; pair of Infinity RS2000 speakers, \$150. Jimmy, x33572 or 996-1382.

Infinity Quantum Jr speakers, 12" 3-way, \$200 OBO. 997-2069.

AT&T 6300 computer, 640K RAM, 30 MB hard card, 2 360K FD, game port and card, 8087 coprocessor, color graphics monitor, \$600 OBO. Keith, x38024 or 554-4309.

"Build Your Own 80286 IBM Compatible and Save a Bundle" paperback, \$8; "Ability" integrated WP, SS, DB SW, \$8; "IMSI Publisher" desktop publishing SW, \$25. Paul, x33571 or 559-2528.

Cerwin-Vega HED-15 high efficiency speakers, 100 W, \$250 OBO. Steve, 282-4108 or 333-3176.

Yamaha V50 synthesizer, 16-note/8-voice multimbral polyphony, built-in 8-track sequencer, rhythm section, digital effects, 600 total voices, performances, and rhythm patterns, \$1000. Martin, x45338 or 488-0949.

Premier upright piano, rosewood, good cond, \$700. 488-5470.

8 channel stereo mixer, KMD MC-802, less than 2 yrs old, custom case, ex cond, \$500. 532-3515.

Tascam Porta 05 4 track recorder, \$300. Jim, 333-7690 or 488-4820.

Need ride from the corner of Bay Area Blvd and Saturn to Bldg 227 around 7 a.m. 286-1620.

Want any sz freezer, cheap. Virginia, 996-6731.

Want baby items, crib, playpen, reasonably priced. 474-2857.

Want riders Bay Area Park & Ride to JSC, leave Park & Ride 7:25 a.m., return 4:45 p.m., \$5/wk. 333-6963.

Want non-smoking roommate for 1 rm in Webster 3 BR, pet OK, \$250 plus 1/3 util. x34368 or 280-0802.

Want roommate for LC 3 BR, furn or unfurn, \$250/mo, bills paid, avail May 1. Eric, x39016 or 334-0546.

Want dog house, 335-4204 or 286-1212.

Want child's plastic construction pieces from "Construx" sets, for future space engineers. Jim, 337-2838.

Want to buy/sell/trade baseball and football cards, have Topps baseball '71 thru '78 and football '75 thru '80. Phil, x32129 or 333-5113.

Want riders for vanpool from SW side, Alief and Braeswood-610 to CL/JSC. \$62/mo. Keith, x30222 or 879-0903.

Want Lark, Rascal or other model elec drive cart. 488-6480 or 944-5615.

Want old watches, any cond, top dollar for Rolexes. 333-6020 or 334-3392.

Want Little Tykes toys, lg cabin, red coupe car, outdoor playset/fort, also Fisher-Price wagon. Mike, x36889 or 484-6281.

Want to lease 3-4 BR house near JSC, university professor, to occupy May 29, '91, \$700-\$800 range. (205) 752-9909.

Want non-smoking fem roommate to share CLC house, \$275 plus 1/2 util. Sharon, x33811 or 480-6713.

Triple dresser /two mirrors, chest of drws, all wood, pecan finish, ex cond, \$300. 485-7264.

Mahogany dining table, 4 chairs, 2 leaves, \$300. Rhonda, 332-6153.

New lg couch w/loveseat, oak frame, \$600; 3 piece sec sofa, ex cond, big pillows, \$800 OBO; 2 piece sold oak BR suite, 8 drvr vanity w/mirrors, 4 drvr dresser w/shelves/doors, \$200 ea or \$375 both. Diana, 996-0130.

Used 30" Magic Chef elect stove, good cond, \$50. Bob Law, 488-4080 x3279 or 383-3452.

Matching loveseat and chair, solid brn, zip-off covers, \$100. Anne, 335-2290.

Used Westinghouse refig, \$100. Wards dishwasher, \$75. Jim, x38321 or 334-4631.

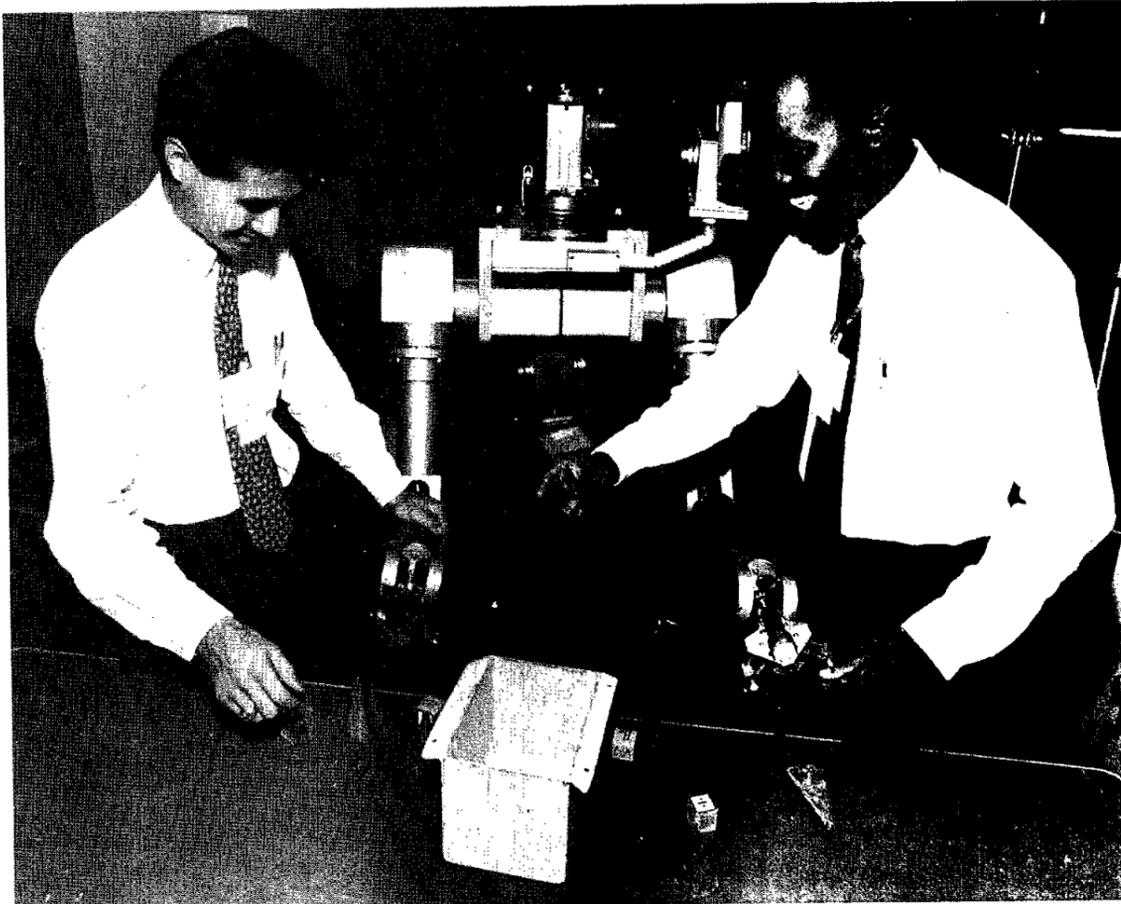
Kitchen table and chairs; beige sleeper sofa; sm m/washer; queen and single box, matt and frames; sm B&W portable TV, Dennis, x30417 or 332-6237.

Mini blind, 48" x 48", brn, ex cond, \$15; lg comfy chair, \$10. Edward, x36250.

Antique green BR suite, full sz bed, mirrored dresser, 5 drvr chest, 2 night stands, \$700; GE dishwasher w/Potscrubber, built-in, almond, works but needs repair, \$5

# Skillful Counselors

## JSC's crew interface experts build better relationships between humans and machines



By Pam Alloway

**Y**ou could call the folks over in the Man-Systems Division's Crew Interface Analysis Section counselors of sorts.

There's no doubt that humans and machines have a much better relationship because of the efforts of the civil servants and contract employees in the division whose jobs are to make hardware as usable as possible for astronauts.

The section's engineers, managers and technicians soothe differences between hardware and astronauts. They not only listen to suggestions, they work to improve the growing interaction between humans and their high-tech tools. That means collecting data on how systems can be improved, listening to problems previously encountered and suggesting better designs and procedures for future projects and programs — like Space Station *Freedom*.

"We have a unique group of human factors researchers and engineers here," said Tandi Bagian, head of the Crew Interface Analysis Section. "Our job is to make sure that things people design and build and think about are made so that humans are kept in mind so that ultimately crew members are able to be as productive as possible in space."

That means getting in on the early planning stages of projects.

"If we can impact the engineers who are designing things for crew members to use at an early stage, it's very likely it will result in a product that's usable rather than having to come back and have crew members have to test it out in the Weightless Environment Training Facility or use it on a mission and say, 'If only this had been a little bit bigger or smaller or a different color than this other one it would

have been easier to use,'" Bagian said.

The section consists of the Anthropometry and Biomechanics Laboratory, Graphics Analysis Facility, Human-Computer Interaction Laboratory, Laser-Based Anthropometric Mapping System, Remote Operator Interaction Laboratory, space habitability applied research programs, and work stations research.

The labs and work conducted in them were displayed during the section's April 25 open house. NASA human factors researchers and engineers, and members of Lockheed's Human Factors Engineering Department, hosted the event.

Researchers recently completed a hand controller commonality evaluation for the Space Station Project Office, Bagian said. There were six major candidate hand controllers for space station operation. Human factors researchers conducted an extensive analysis using crew members and other researchers to determine a set of guidelines that could be used to select a hand controller that would be the most usable for space station tasks.

"That saved the space station program money," Bagian said. "They didn't have to keep funding six different hand controllers and then pick one without a lot of information. We were able to give them hard data that said this is the one people were most successful on."

On STS-40, a detailed secondary objective will look at several human factors elements including the noise and vibration levels in the orbiter, stowage and how easily experiments and equipment can be deployed.

The Anthropometry and Biomechanics Laboratory is in Bldg. 29, Rm. 159. Researchers and engineers in the lab design and conduct experiments dealing with strength, range of motion, gait, and other biomechanical activities. After the measurements of human capabilities

are quantified, they are compared to similar activities that occur in simulated lunar, Martian and zero-gravity environments to collect additional data.

The Graphics Analysis Facility, formerly known as the PLAID lab, is in Bldg. 15, Rm. 119. Researchers and engineers in this lab provide three-dimensional graphics analysis support. They use an interactive computer graphics package titled "PLAID/JACK" to address human factors issues in spacecraft design, mission planning, viewing analysis, computer animation scenarios, human modeling, lighting studies, human force and motion analysis.

One application of the section's projects involves the modeling of what an orbiter's cameras would see while in flight. That application takes place routinely in the Graphics Analysis Facility, Bagian said.

"We've got it accurately modeled in three dimensional graphics so we can say if you were to look through camera B at a payload which we accurately model for every flight, if you zoom in as much as you could with this camera you would see the guides," Bagian said. "That then gives them an idea what the best views would be, what lights they'd need and what orientations would be best to see something."

Researchers and engineers in the Human-Computer Interaction Laboratory, in Bldg. 17, Rms. 143 and 144, support applied research, prototyping, and development of human-computer interfaces for space systems.

The Laser-Based Anthropometric Mapping System is in Bldg. 15, Rm. 201. The system creates a three-dimensional map of an object, such as a hand that could be used in the sizing development of an extravehicular activity glove. The system can provide precise standard anthropometric measurements as well as sur-

face area and volume computations. Researchers and engineers then can integrate the data into the PLAID databases which contribute to more realistic modeling and animation.

Researchers and engineers in the Remote Operator Interaction Laboratory in Bldg. 15's high bay area, Rm. 2001, evaluate astronauts' interactions with remotely operated systems like robotic arms. The lab includes remote manipulators and a camera control device that has been designed to be worn on an astronaut's head. Work in this lab also includes video image enhancement techniques and voice-commanded systems.

The section's researchers and engineers also are involved with space habitability applied research programs and analyses, all of which are designed to ensure optimum crew performance during extravehicular and intravehicular activities in both zero and partial gravity.

They also help develop guidelines and requirements related to noise and vibration, maintenance, viewing analysis and lighting. Researchers collect, document and maintain information through database systems. They then assess, evaluate and document crew interfaces with the hardware and help identify any human interaction issues. Man-Systems Integrated Standards and Operational Experience data bases, and other space habitability facilities and systems are housed in Lockheed Plaza-2, one of the two Lockheed buildings across NASA Road 1 from JSC.

Additionally, scientists and engineers are researching work stations and their integration into the space station, analyzing hardware, display and controls layouts, looking at how systems fit with the human form, investigating how tasks are performed and designing hand controllers that are compatible with several different systems.



JSC Photos by Benny Banavides

**Top:** Lockheed engineers Steve Nakata (on left) and Terry Fleming prepare a task for the "Remotec" dual arm manipulator system. The system is housed in Bldg. 15's Remote Operator Interaction Laboratory. **Left:** Samia Chedid, a Lockheed production manager in Bldg. 15's Graphic Analysis Facility, demonstrates the use of a simulated ratchet tool which drives a computer simulated human arm. **Above:** Dr. Marianne Rudisill, manager of the Human-Computer Interaction Laboratory, and Lockheed engineer Michael O'Neal work in the laboratory's television production control room which is located in Bldg. 17.

## 'Commitment to Excellence' is theme

# General to address Asian Pacific Americans

The fourth annual JSC Asian Pacific American Heritage Day will feature a keynote address by Air Force Maj. Gen. Vernon Chong.

Chong is the command surgeon for the Air Force Headquarters Air Training Command and commander of the Joint Military Medical Command at Randolph Air Force Base, Texas.

He participated in the manned space program as a member of the launch site recovery forces for all of the Apollo, Skylab and Apollo-

Soyuz missions.

This year's celebration, focusing on "Asian Pacific Americans: Commitment to Excellence," begins at 9 a.m. May 10 at the Gilruth Center.

The day begins with a 9-11:15 a.m. career development workshop on "Politics in the Workplace" led by Dr. Kwang Hai Ro, professor of political science at Texas A&M University.

Chong will speak during the 11:30 a.m.-1:30 p.m. luncheon.

The afternoon session, a work-

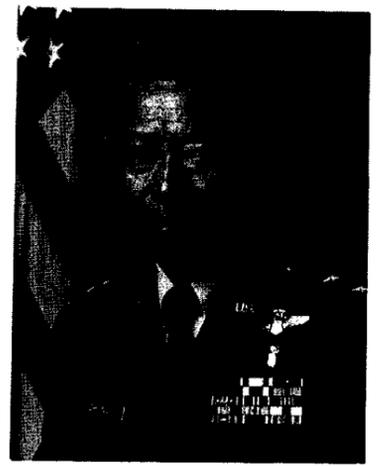
shop on "Communications — A Verbal and Non-Verbal Agenda," will be from 1:45-4:30 p.m. Dr. Joanne S. Yamauchi, professor of communication at The American University, will lead the workshop.

JSC employees are invited to participate as their workloads permit. The public, employees of other government agencies, and contractors also are invited. Workshop registration will be on a first-come, first-served basis.

Tickets for the luncheon are

available for \$7.50 from any Asian Pacific American Council member, and must be purchased by Monday.

Council members are: Freda Marks, x30603; Hanh Nguyen-Xuan, x36805; Sophia LeCour, 282-3798; Susan P. Ford, 282-7532; Richard Long, 333-6183; Chiu-Wing Lam, x37223; Kamlesh Lulla, x35159; Lak Putcha, x37780; Jan Chen, 282-3411; Kumar Krishen, 283-5875; and Dorothy Rasco, x33150.



Maj. Gen. Vernon Chong

## Homecoming plan brings crew in late

The STS-39 crew return ceremony will be at Ellington Field's Hangar 990 about nine hours and 45 minutes after *Discovery* lands at Edwards Air Force Base in California.

Based on a planned 1:57 p.m. Monday landing at Edwards, the Ellington ceremony would begin about 11:45 p.m. Monday.

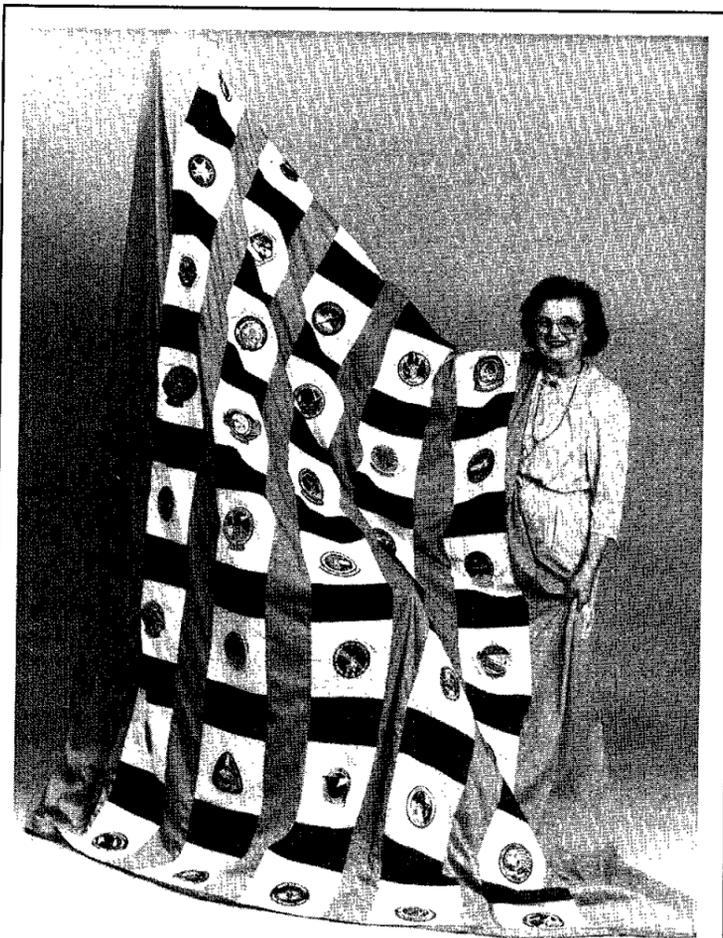
Since many variables are involved in mission operations, crew return times may change with little notice. Employees are encouraged to call the Employee Information Service at x36765 for the latest information.

## JSC employees receive awards

JSC Director Aaron Cohen presented awards to 21 employees on April 23. Productivity Improvement Awards went to Keith Albyn, for Vacuum Systems for the Measurement of Volatile Condensable Materials; James A. Smith Jr., James M. Janney and John J. Kennedy, for Deletion of Orbiter Rudder/Speed Brake Heat Sink.

Patent Application Awards went to Horacio M. de la Fuente, Kornel Nagy and Clarence J. Wesselski for an Energy Dissipator with Automatic Reset; William C. Schneider and Jon B. Kahn, for a Debris Catcher for Space Shuttle Orbiter; Thomas J. Dunn for a Metallic Threaded Composite Fastener; Richard D. Juday for a Two-Dimensional Vernier; Wallace C. Tuthill Jr. for a Dual-Diaphragm Tank with Telltale Drain; and Mark E. Rovig for a General Machine Image Pattern Classifier.

Scientific or Technical Contribution Awards went to Steven L. Koontz for a Microporous Structure with Layered Interstitial Surface Treatment, and Method and Apparatus for Preparation; Robert L. Dotts, Richard L. Bullock, John W. Orsag, Edward T. Chimenti, Chin H. Lin and Eugene K. Ungar, for a Systems Improved Numerical Differencing Analyzer and Fluid Thermal Program; and David A. Wolf, for a Bio-Reactor Cell Culture Process, Three-Dimensional Cell to Tissue Assembly Process, Horizontally Rotated Cell Culture System and a Three-Dimensional Coculture Process.



JSC Photo by Jack Jacob

Ruby Summers shows off the bedspread she's sewn that includes every patch from the first 38 shuttle flights and the Approach and Landing Tests, as well as the autographs of the astronauts who flew them.

## Secretary combines patches in warming shuttle tribute

By Kelly Humphries

The shuttle program, in a sense, keeps long-time JSC secretary Ruby Summers warm at night.

She's created a fabric memorial to the first 10 years of the program in the form of a bedspread containing the first 40 shuttle mission patches. And to add the final stitch, the spread has the autographs of almost every crew that's flown. The only exception is the STS 51-L patch, which doesn't include the signatures of those who died aboard Challenger.

Each patch is mounted on a 9 1/2 inch square of white trigger cloth and surrounded by the crew's signatures. The squares are joined by red and blue Palencia broadcloth.

"I've been working on it for some time getting autographs, probably a

year or so, but I hadn't sewed a stitch on it 'til the week before Easter," she said.

Summers retired from JSC's Cargo Engineering Office in November after more than 26 years here. A 14-year veteran of the Flight Crew Operations Directorate as well, she's back again now as a temporary employee in the Test and Ground Systems Engineering Office.

"I've always kind of collected autographs to some extent and it just came into my mind one day that I wanted to do this," she said.

"I bought a new queen-sized bed just to put it on," she said. "That's about all I plan to do with it unless somebody offers me a fabulous sum for it someday."

## Hubble gets kudos despite spherical aberration; takes 23 photographs

(Continued from Page 1)  
instruments. (Project officials hope to complete science verification late this year or early in 1992);

- Released 23 images taken by HST and the first spectrograph; and
- Resulted in the publication of a number of scientific papers and the presentation of data from observations at many key scientific meetings.

Rothenberg said ground controllers have developed and installed two major improvements to ground software without imposing on operations and have developed onboard software that significantly reduces the effects of solar array

"jitter" affecting spacecraft pointing control.

During early operations, the solar arrays caused a "jitter" in the spacecraft when it went from daylight to darkness and vice versa. The jitter, which would last up to eight minutes, prevented the spacecraft from "locking" onto guide stars used to point the spacecraft.

The software used to alleviate the jitter, developed at Goddard and Marshall Space Flight Centers, is known as SAGA, for Solar Array Gain Augmentation. The software reduces the frequency of the jitter and cuts the length of time the vibration in half.

## JSC contractor earns small business award

Recognizing the importance of small business and the people who run those businesses is the intent of an annual Small Business Week that begins Sunday. A JSC prime contractor, Diversified Management Services, will receive the Small Business Administrator's Award of Excellence during this year's Small Business Week ceremonies in Washington, D.C.

Accepting the award in Washington will be Arthur Callahan, DMS vice president, and Ivy Alexander, the company's project manager.

Additionally, this year JSC honored Betty Burg and Jennifer Reynolds as its "Small Business Buyers of the Year."

Burg, a contract specialist, was honored as the JSC buyer whose cooperative efforts have resulted in the largest number of new awards to small business by a single buyer. Reynolds, also a contract specialist, receives an award for having the largest dollar volume of

new awards to small business during fiscal 1990.

Since its beginning, NASA has recognized the potential of the small business community and has worked actively to use the resources and talents offered by small businesses.

During fiscal year 1990, JSC placed more than \$120 million with small business firms, a record amount for the center. Bob Dupstadt, JSC's small and disadvantaged business coordinator, believes JSC employees are the ones who deserve a pat on the back for that record amount.

"It's attributed to the outstanding cooperation of the user directorates throughout the center in the utilization of small business concerns," Dupstadt said. "We've been emphasizing it for years and it keeps getting better and better."

During fiscal year 1989, JSC spent more than \$100 million with small business firms.

## Malarkey milkshake successful

(Continued from Page 1)  
problems, however, caused some rescheduling.

The far-field maneuvers were delayed a day because the Cryogenic Infrared Radiance Instrumentation for Shuttle experiment was using its liquid helium coolant faster than expected. In an effort to get as many CIRRIIS aurora observations as possible before the helium ran out, Mission Control delayed the plume recognition experiments.

The crew encountered a nine-hour delay in positioning the SPAS-II when the pallet's Sun sensor locked onto a bright object other than the Sun and altered its attitude to protect IBSS' instruments. Another minor difficulty resulted when two data

recorders on the Air Force Program-675 payload failed to activate for several low-priority observations.

*Discovery* moved to within a mile-and-a-half of SPAS-II and the IBSS early Thursday for the near-field maneuvers, then moved on to the Chemical Release Observations with three subsatellites. Those observations were scheduled to continue today.

*Discovery* sprinted into orbit at 6:33 a.m. CDT Sunday, delayed 30 minutes by an onboard recorder that activated itself at the wrong time but posed no threat to launch safety. The eight-day flight is scheduled to end with *Discovery's* landing at 1:57 p.m. Monday at Edwards Air Force Base in California.

## Visitor Center groundbreaking May 28

(Continued from Page 1)  
as production architect.

Space Center Houston will feature a visual timeline of human space flight using theatrical and interactive "hands on" presentation techniques to portray both the physical and intellectual challenges of space exploration.

Guests also will get a behind-the-scenes look at the inner workings of JSC through a Mission Status Center and tram tours of the key work areas.

"It's a museum, and we don't want to be a theme park," Ablott said. "We want people to understand that manned space flight is about."

Space Center Houston is expected to draw two to three million visitors a year and contribute about \$100 million to the local economy during its first year of operation. The construction phase is expected to create about 500 jobs and the new facility will employ about 2090 full-time workers.

## Space News Roundup

The Roundup is an official publication of the National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Texas, and is published every Friday by the Public Affairs Office for all space center employees.

Swap Shop ads are accepted from current and retired NASA civil service employees and on-site contractor employees.

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